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09/820,710	03/30/2001	Takashi Kato	684.3166	4478
5514	7590	02/26/2004	EXAMINER	
FITZPATRICK CELLA HARPER & SCINTO 30 ROCKEFELLER PLAZA NEW YORK, NY 10112			AMARI, ALESSANDRO V	
			ART UNIT	PAPER NUMBER
			2872	

DATE MAILED: 02/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/820,710

Applicant(s)

KATO ET AL.

Examiner

Alessandro V. Amari

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 28 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3,5,10-13,37-46,54 and 56-64 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12,37-46,58,59,63 and 64 is/are allowed.
- 6) ☒ Claim(s) 1-3,5,10,11,13,54,56,57 and 60-62 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/28/2004.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 28 January 2004 has been entered.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 2 and 56 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In regard to claim 2, the limitation, "wherein said projection optical system does not include any one of a lens, a mirror and a diffractive optical element having a negative power" constitutes new matter since all the embodiments as shown in Figures 3, 4, 5, 6A, 7 and 8 all include at least one element that has a negative power. Claim 56 inherits the same issue since it is dependent on claim 2.

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4. Claims 10 and 57 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In regard to claim 10, the limitation, "wherein said projection optical system has no mirror with a power" constitutes new matter since all the embodiments as shown in Figures 3, 4, 5, 6A, 7 and 8 all include mirrors (M1, M2) that have a power. Claim 57 inherits the same issue since it is dependent on claim 10.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 2 and 56 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In regard to claim 2, the recitation of said projection optical system "does not include any one of a lens, a mirror and a diffractive optical element having a negative power" is ambiguous. The phrase, "any one of" can imply that none of the elements can have a negative power or that only one of the elements can have a negative power and so is uncertain and indefinite. Claim 56 inherits the same issue since it is dependent on claim 2.

7. Claims 10 and 57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In regard to claim 10, the recitation of said projection optical system "said projection optical system has no mirror with a power, other than the single concave mirror of said first imaging optical system" is ambiguous. The phrase, "has no mirror with a power" can imply that only one mirror in the system does not have a power or that no mirrors in the system can have a power and so is uncertain and indefinite. Claim 57 inherits the same issue since it is dependent on claim 10.

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1-3, 5 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Shafer et al U.S. Patent 5,999,310.

In regard to claim 1, Shafer et al discloses (see Figure 4) a projection optical system, comprising, a first imaging optical system (122) consisting of at least one lens (125) and said at least one concave mirror (124), for forming an intermediate image (126) of an object; a second imaging optical system (139), consisting of at least one second lens and at least one diffractive optical element as described in column 5, lines 65-67 and column 6, lines 48-54, for projecting the intermediate image onto an image

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plane (140); and a field optical system (127) disposed between said first and second imaging optical systems, said field optical system having at least one third lens wherein said second imaging optical system has no mirror, and in said projection optical system, a central position of a pupil is not blocked with respect to light as shown in Figure 4.

Regarding claim 2, Shafer et al. discloses (see Figure 4) a first imaging optical system (122) consisting of at least one lens (125) with a positive power and at least one concave mirror (124), for forming an intermediate image (126) of an object; a second imaging optical system (139), consisting of at least one second lens with a positive power and at least one diffractive optical element as described in column 5, lines 65-67 and column 6, lines 48-54, for projecting the intermediate image onto an image plane (140); and a field optical system (127) disposed between said first and second imaging optical systems, wherein said projection optical system does not include any one of a lens, a mirror and a diffractive optical element having a negative power as is currently understood with the given claim language.

Regarding claim 3, Shafer et al. discloses that said at least one first lens, said at least one concave mirror, said at least one second lens and said at least one diffractive optical element have a positive power as shown in Figure 4.

Regarding claim 5, Shafer et al. discloses (see Figure 4) that said first and second imaging optical systems are disposed along a common straight optical axis as shown in Figure 4, and wherein abaxial light from the object as reflected and collected by said concave mirror passes through an outside portion of an effective diameter of

said concave mirror as described in column 5, lines 58-61, toward the image plane side as shown in the lens group 122 in Figure 4.

Regarding claim 13, Shafer et al. further discloses (see Figure 4) a field stop (131) adjacent to an intermediate image to be formed by said first imaging optical system.

10. Claim 2, 10 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Foo US Patent 5,515,207.

Regarding claim 2, Foo discloses (see Figure 1) a projection optical system, comprising a first imaging optical system (20, 30), having at least one first lens with a positive power and said at least one concave mirror, for forming an intermediate image (70) of an object; a second imaging optical system (50), having at least one second lens with a positive power and said at least one diffractive optical element with a positive power as described in column 2, lines 51-55, for projecting the intermediate image onto an image plane (15); and a field optical system (40) disposed between said first and second imaging optical systems, wherein said projection optical system does not include any one of a lens, a mirror and a diffractive optical element having a negative power as shown in Figure 1 as is currently understood with the given claim language.

Regarding claim 10, Foo further discloses (see Figure 1) a projection optical system, comprising a first imaging optical system (20, 30), consisting of at least one first lens and said at least one concave mirror, for forming an intermediate image (70) of an object; a second imaging optical system (50), consisting of at least one second lens and said at least one diffractive optical element as described in column 2, lines 51-55, for

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projecting the intermediate image onto an image plane (15); and a field optical system (40) disposed between said first and second imaging optical systems, a substantially flat mirror (68) disposed adjacent an intermediate image formed by said first imaging optical system, and wherein said projection optical system has no mirror with a power (20b, 20c, 40b, 68), other than the single concave mirror of said first imaging optical system as shown in Figure 1 as is currently understood with the given claim language.

Regarding claim 13, Foo further discloses a field stop adjacent to an intermediate image to be formed by said first imaging optical system as described in column 3, lines 40-53.

***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claim 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shafer et al. U.S. Patent 5,999,310 in view of Kuba U.S. Patent 5,623,365.

Regarding claim 11, Shafer et al discloses the invention as set forth above but does not teach wherein at least one of diffractive optical elements of said projection optical system satisfies a relation:  $3 < MP/\lambda < 50$  where MP is a minimum pitch (micron) of the diffractive optical element, and  $\lambda$  is the exposure wavelength (micron).

Regarding claim 11, Kuba does teach use of diffractive optical elements which satisfy a relation  $3 < MP/\lambda < 50$  where MP is a minimum pitch (micron) of the diffractive



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optical element, and  $\lambda$  is the exposure wavelength (micron) as shown in Figures 8 and 11.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the diffractive optical element as taught by Kuba in the projection optical system of Shafer et al in order to correct chromatic aberrations.

13. Claims 54 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shafer et al U.S. Patent 5,999,310 in view of Stanton et al. U.S. Patent 5,631,721.

Regarding claim 54, Shafer teaches the projection optical system as described in claim 48 above and as described in column 3, lines 65-67, but does not teach a device manufacturing method, comprising the steps of, exposing a wafer to a device pattern and developing the exposed wafer.

Regarding claim 54, Stanton et al does teach a device manufacturing method, comprising the steps of, exposing a wafer to a device pattern and developing the exposed wafer as described in column 1, lines 15-19.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the projection optical system of Shafer et al in the method of Stanton et al. in order to increase semiconductor device manufacturing yields.

14. Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Foo U.S. Patent 5,515,207 in view of Stanton et al U.S. Patent 5,631,721.

Regarding claim 57, Foo teaches the invention as set forth above but does not teach a device manufacturing method, comprising the steps of, exposing a wafer to a device pattern and developing the exposed wafer.

Regarding claim 57, Stanton et al does teach a device manufacturing method, comprising the steps of, exposing a wafer to a device pattern and developing the exposed wafer as described in column 1, lines 15-19.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the projection optical system of Foo in the method of Stanton et al. in order to increase semiconductor device manufacturing yields.

15. Claims 60 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shafer et al US Patent 5,999,310.

In regard to claims 60 and 61, Shafer teaches the invention as set forth above, but does not teach projecting a pattern of a mask onto a substrate. It is well known in the art to utilize mask patterns in the projection optical art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to project mask patterns in the optical system of Shafer et al in order to provide for a more precise coding pattern for the substrate to be imaged.

16. Claim 62 is rejected under 35 U.S.C. 103(a) as being unpatentable over Foo US Patent 5,515,207.

In regard to claim 62, Foo teaches the invention as set forth above, but does not teach projecting a pattern of a mask onto a substrate. It is well known in the art to utilize mask patterns in the projection optical art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to project mask patterns in the optical system of Foo in order to provide for a more precise coding pattern for the substrate to be imaged.

***Allowable Subject Matter***

17. Claims 12, 37-46, 58, 59, 63 and 64 are allowed as indicated in previous office action.

***Response to Arguments***

18. Applicant's arguments filed 28 January 2004 have been fully considered but they are not persuasive.

The Applicant argues that since the aperture is formed on the concave reflector 124, some of the light from the object 120 necessarily will proceed through the central aperture and that this light will impinge on the imaging plane 140 and degrade image contrast, while the rest of the light proceeds directly through the central aperture will be blocked by an aperture stop 131, resulting in a loss of light quantity and thus light from a central portion of a pupil is at least partially blocked.

In response to this argument, the Examiner would like to remind the Applicant that the rejection is based upon the claim recitation. Claim 1 requires that in the projection optical system, a central position of a pupil is not blocked with respect to light. Figure 4 of Shafer et al does show a central position of a pupil (i.e., the central axis of the projection system) not being blocked with respect to the light. Examiner fails to see the distinction between some of the light proceeding through the central aperture while the rest of the light is blocked by an aperture stop would preclude Shafer from reading on claim 1. Furthermore, Figure 4 does not show that aperture 131 blocks any of the light and in the description, aperture 131 is used to adjust the system imaging numerical aperture (see column 5, lines 35-37).

The Applicant further argues that in regard to claim 2, the claim recitation that the projection optical system does not include any one of a lens, a mirror and a diffractive optical element having a negative power, while Shafer et al discloses a planar reflector 123 which has a negative power. Furthermore, Foo discloses a lens group 30 having a negative power.

In response to this argument, the Examiner directs the Applicant's attention to the 112 2<sup>nd</sup> paragraph rejection above wherein the phrase, "any one of" can imply that none of the elements cannot have a negative power or that only one of the elements cannot have a negative power. Therefore, the claim can be interpreted such that if one of the other elements has a positive power, (for example, mirror 124 or the diffractive optics in the second imaging optical system 139) the claim still reads on Shafer et al. This same response applies to the argument for the Foo patent as well.

The Applicant further argues, in regard to claim 10, that the claim recitation that the projection optical system has no mirror with a power, other than a single concave mirror excludes Foo as being prior art since Foo discloses at least two concave mirrors 20a, and 20c.

In response to this argument, the Examiner directs the Applicant's attention to the 112 2<sup>nd</sup> paragraph rejection above wherein the phrase, "has no mirror with a power" can imply that the prior art reads on the limitation if only one mirror in the system does not have a power (for example 20b in Foo) or if no mirrors in the system have a power. Furthermore, the phrase, "has no mirror with a power" is not limiting since all mirrors have a power whether it be positive, negative or unity (i.e., 1:1).

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19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alessandro V. Amari whose telephone number is (571) 272-2306. The examiner can normally be reached on Monday-Friday 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on (571) 272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ava *ava*  
20 February 2004

  
MARK A. ROBINSON  
PRIMARY EXAMINER